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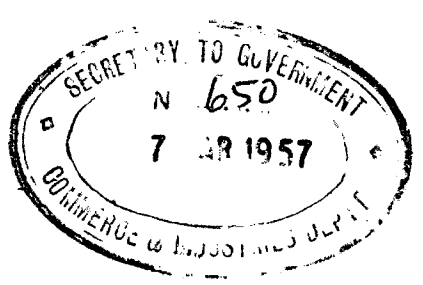
RHABC DEPARTMENT

BRANCH B. Class

Karnataka

Subject:—

Control on Iron and steel



Original file CIS 1053 VII

Class Common

Rev (CT)

To Supdt. Industries Sec

B Class

Karnataka

File No. CIS 1053

Sta. Sectt. Slip 24-A

Appendix 'J'

STEEL UTILISATION
MEMORANDUM FOR THE STEERING COMMITTEE OF THE PARLIAMENTARY AND SCIENTIFIC COMMITTEE.

Although steel production in the United Kingdom is running today at record levels, the Government has stated that a shortage of steel is responsible for much of the delay in completing constructional and engineering projects both at home and abroad. There is also a large unsatisfied demand overseas for British steel, which cannot be met at present. While there are likely to be only short term problems it will at all times be important that the most effective use should be made of any valuable raw material such as steel.

The Parliamentary and Scientific Committee has, therefore, examined this question. Broadly speaking, there are FOUR lines of approach:-

a) use of alternative materials;
b) welding;
c) design improvements;
d) use of steels of higher performances.

a) When steel for structural purposes is replaced by concrete or wood the question of cost has to be considered in relation to the economy in steel effected. It is important not to exaggerate the amount of saving that can be achieved. But an example is apparent in one new Government building which was taken 7,500 tons of structural steel at least a quarter of which and probably more would have been saved, if reinforced concrete, has been used.

Under suitable conditions other ferrous materials, such as iron or steel castings may also be substituted for structural steel. This has been done for example where cast iron crankshafts have replaced forged steel components in oil and I.C. engines.

b) Considerable economics can be achieved by the use of welding in place of riveting provided that full advantage is taken of the welding technique and the improved designs which it makes possible. As much as 25% of the wight of steel can be saved in certain welded structures, but it must be remembered that welding puts a greater responsinility on both operatives and inspectors. Provided care is taken there need be a few failures in service. Of 5,000,000 Bailey Bridge units tested during the war, there were only 140 failures on test due to welding less than 0.03%.

c) Apart from welding there is considerable scope for improving design of structures and mobile equipment such as railway wagons, cranes motor cars and ships. Many design offices think in terms of the cheap and abundant supply of steel of former years, when it suited the designer to use a greater weight of steel rather than to fabricate it into a lighter structure involving greater labour. Nor are up-to-date methods for accurate calculation always used in drawing offices. The so-called factors of safety decided upon many years ago still continue to perpetuate heavier structures than are necessary in the light of present knowledge of what stresses really occur. The best method of forcing a break with these out of date concepts is to replace obsolete specifications and practices by really high performance ones in which all the factors making for economy in end use are given full play.

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During the war when it was essential to achieve the utmost economy in steel, the BS for structural Steel in

Building was revised to take fuller account the higher quality of mild-steel than the general body of such specifications permitted. The basic working stress in the war emergency revision was increased by 25% to 10 t/sq. in. (from 8t/sq.in.) which led to considerable economics in the large programme of work then being carried out. But the large programme of work then being carried out. But the favourable experience gained as a relut did not prevent a reversion to the pre-war standard with a consequently increased consumption of steel to achievethe same objects.

The revision of BS 449 for the use of structural steel is building has now beencompleted and provided for the permanent increase of the working stress(forexample in bending from 8 to 10 t/sq.in.) for a mild steelwith a guaranteed yield point and correspondingly higher working stress forthe high tensile steels. Moreover, BS 449 is now nationally accepted specification for building and engineers are therefore able to design with confidence onthese higher working stresses.

The Steel industry as a whole has agreed to supply mild steel with a guaranteed yield point at a small extra charge, and there is no reason to suppose that it will not be readily available on demand.

Code of Practice 113 , published at about the same time as BS 449 and prepared under the aegis of the Ministry of Works, covers much the same ground and makes indentical recommendations. In addition Code of Practice 114, previously published, deals in a similar way with reinforced concrete.

d) One of the greatest single fields for improvement lies in the use of steels of better mechanical properties. These can be more highly stressed than mild steel and this make possible a saving in the amount required . Further economies can be achieved if weldingis used.

High tensile low alloy steels derive their extra strenght mainly frema relatively low content of alloying elements. In this country the history of these steels goes back some 25 or 30 years whenthe Admiralty develped a series of "D" steels for naval construction. Following parallel developments by several steel making firms specifications BS 548 (1934) and BS 968 (1949) were developed for high tensile low alloy steels the second covering steels suitable for welding. Steels, the second covering steels sutiable obtained frema most steel making firms. During the war well over half a million tons of steel were made forthe Bailey Bridge programme to be modified BS 968 specifications and though a higher yield stress was required withthe welding qualities of that steel British Steel makers were fullyup to the designers. But in addition to the BS grades of high tensile steel for structural purposes most British steelmakers have develped specialqualities of their own in the high tensile range which add greatly to the types of steel available for various constructional and shipbuilding uses. M/s. Colvilles Ltd., for example markets a range of five steels falling within ine erether of these specifications with yield points (on thicknesses upto 1") ranging from 19 to 27 t/sq.in. . This is the Duceal range and in addition this firm manufactures the American Cor-Ten under licence, Some other proprietary are United Steel's Kupulus; Consett's Conicro; and Dorman Long's

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Development in America has been rapid. As in England a number of proprietary brands are produced. United States Steel Corpn-Cor Ten; Great Lakes Steel Corporation -Max; Inland Steel Co.- Hi steel . The composition of last named is given below, together with the ranges of composition specified in BS 548 and 968 and the respective U.T.S. and yield stresses

	BS 548	BS 968 (a)	BS 968 (b).	Hi Steel.
Carbon.	0.30max.	0.28 max.	0-23 Max.	0.12
Manganese	1.5	1.8 "	0. 8 "	0.5/1.0
Copper	-	0.6 max.*	0.6 max.*	Cu & Ni between 0.5&1.5
Sul & Phos.	0.05max.	0.06,ax-	0.06max-	low as poss-
Chromium		0.8	-----	

* by arrange,ent

U.T.S. 37/42 33.41@ = BS 968 (a) 31/22

Yield stress 19/23@ 19/21@

@ according to section thickness.

American designers have made good use of high tensile low alloy steel in transportation. The Railroad Research Bureau of the U.S. Steel Corporation for example have designed and constructed a completely welded light weight hopper car (for hauling coal iron ore and lime stone) which not only weighs 3 tons less than the standard riveted design of the association of American Railroads but is claimed to have efficien added cubic capacity for 34 tons more coal. (It must be remarked that the overall length of this car is 35ft. 2"). Another example is that of mine cars for underground work in the coal pits of America. One such design is for a high strenght car of 6,000 lb. weight and 232 cu.ft. capacity to repace plain steel cars of 4,000 lb. and 135 cu.ft. -200 of the new hauling as much as 344 of the old with 130 tons less dead weight.

It is of interest to note that in this country before the war the L.M.S. Railway carried out experimental work on passenger coaches with high tensile steel and welded construction whereby economies of the order of 12½% were effected. A number of mineral wagons have also been built by this Railway and by one of the steel works for internal use.

Based on American experience the following saving are estimated to be obtainable in the construction of the British steel minerals wagon at present being produced in large numbers from mild steel. Taking the tare weight as 7½ tons an immediate weight saving of about 1ton could be made without complete redesign by the use of a high tensile low alloy steel. Thus on a purely weight basis 16 alloy steel wagons could be made with the same weight of steel as has been required for 15 mild steel wagons. If the wagon were redesigned to take full advantage of the properties of the alloy steel then a weight reduction from 7½ tons tare to 6½ tons could be reasonably expected while the payload could be increased through redesign byabout 1½ tons i.e. 7½ at least. This would involve no increase in axle load .

The effect of these savings based on American Railway experience can be illustrated by a practical example. In order to transport 1,000 tons of coal, 63 16ton wagons are required each weighing 7½ tons against 58 7½ tons wagons each 6½ tons. Thus 362 tons of steel are required against 472 tons. The initialsaving in steel for the construction of wagons to carry 1,000 tons of coal is therefore 110 tons or 23%. And there are of course the further longterm savings due to the improved corrosion and abrasion resistance of alloy steel to be taken into account.

In addition to this there are the substantial economics obtained by the requised deadweight of the train. A 1000 ton coal train of ____ steel trucks would weigh 1362 tons;

T.D.S.

Structures of moderate size have already been built in aluminium alloys. These include framework for houses, gantry cranes of spans 60' to 75', and of capacity 10 tons to 50 tons dragline booms of 175' length, wireless masts 150' high roofs partitions doors and windows, awnings and similar items such as shop fronts architectural metalwork, handrails, balustraders, &c. In the field of bride contructions(a) a 100 ft. span in aluminium alloy for railway loading exists in America, (b) an arch of 290' span and 47'6" rise for a road bridge is under construction in Canada and (c) a Bascule bridge with a clear opening of 90' has been completed recently in Britain.

Attempts are beingmade in our country by Central Standards Office of the Ministry of Railways to introduce aluminium alloys in the construction of structures including bridges and of vehicles.

2. ECONOMIC CONSIDERATIONS.

The cost at present is the one factor which hinders the Engineer from making greater use of aluminium alloys. The price per ton for extrusions is approximately 11 times that of steel. Import duties have been accounted for in assessing the relative costs. As the weight of the material required for a structure of the same strength as the steel structure is about 45% that of steel the cost of an aluminium alloy structure is at present about 5times thatof an equivalent steel structure. Assuming that the relative cost per ton of aluminium alloy will stabilise in course of time to about 4 times that of steel the cost of steel structure. This higher cost will, however, be offset by-

(a) possible longer life,
(b) possible lower maintenance costs,
(c) higher scrap value,
(d) lighter weight of structure resulting in lighter and, therefore cheaper foundations and in the case of bridges cheaper substructureres also.

It may to mentioned that the figure of relative cost per ton (4times that of steel) does not apply to all aluminium products. For instance, it is gathered that the cost of corrugated aluminium sheets is not likely to exceed, in the near future, twice the cost of corrugated iron sheets of equivalent strength. Indigenous development of aluminium alloys is likely to reduce the cost of the material considerably. Conditions in our country are very favourable to such developments as India has extensive deposits of Bauxite. The consumption of electric energy for reducing the ore to aluminium is heavy (about 10 times kW. hours per pounds of aluminium) but is likely to be obtained at a low rate of harnessing the numerous rivers in our country. At present conditions are particularly favourable to thedevelopment of luminium alloys as the demand for teel far exceeds the supply and with the completion of the vast irrigation cum Hydro electric projects now under construction, it would be advantageous to use a part of the energy available for manufacture of aluminium.

3. POSSIBLE IMMEDIATE USES

Until the cost is reduced to about four times the cost of steel, aluminium alloys are not likely to be used to the same extent as steel in structures. Their use will be confined to those structures or parts of structures where some further advantages in addition to its lighter weight and further advantages in addition to its lighter weight and comparative immunity from corrosion, are obtained . This ratio however does not apply to structures in which the percentage of dead load to design load is high as in long span bridges vide item (e) of the following paragraph.

Alluminium.....

Alluminium alloys may be introduced immediately with advantage in the following cases :-

(a) Long span road and rail bridges, particularly when the proportion of dead load to live load is high. Assuming that for a long span bridge the dead load and live load including dynamic effect of a steel structure are equal with aluminium alloys the saving in dead load would be 55% on the assumption an alluminium alloy structure weight 45% of a steel structure of equal strength. This amounts to a saving of 27½% in the design load. As smaller sections will be equired for this smaller design load there is a further reduction in the dead load-. If WA is the dead load of aluminium alloy span considered as a percentage of the design load of the steel span

$$\frac{WA \text{ plus } 50\%}{\frac{100}{45}\ WA} = \frac{50\% \text{ plus } -50\%}{50\%}$$

Hence WA = 14.5% of the design load of the teel span.

$\frac{100}{50} \times 14.5 =$ only 29% of the dead load of the steel span.

(b) Renewal of girders on existing bridges where time factors is important.

(c) Renewal of decks of existing long span bridges which are inadequate in strenght for prevailing loading. The dead load saved may (i) sufficiently overcome the necessity for renewal ~~or overcome the necessity for renewal~~ or strengthening of the main girders, and (ii) permit relaxation or removal of restrictions to speed.

Apart from this, aluminium alloy decks need very little maintenance against corrosion. This is amply demonstrated by the Pittsburg bridge in America where the floor renewed with aluminium alloys over a decade age has been found to be in almost perfect condition without any maintenance.

(d) In the conversion of existing rail bridges to combined road-rail bridges with separate decks. The existing steel rail deck may be replaced with an aluminium alloy deck and a road dock also of aluminium alloy may be provided. This arrangement is likely to apply to long spans only and particularly to those rlail bridges which were originally built for a loading higher than the existing loadin .

(d) Replacement of existing rial decks with a combined road- rail deck of aluminium alloy.

(f) Construction of Bascule bridges. Considerable saving in counterweight an in the power necessary for operating of such bridges will be effected.

(g) Construction of light weight decks in new combined road-rail bridges-

(h) Construction equipment such as derricks gantries mobile cranes where reduction in weight is an important consideration.

(i) Construction of sheds and shocs with large unobstructed floor areas such as hangers, assembly halls, etc.

(j).....

(j) In mobile structures , such as, road vehicles and railway vehicles of all types including wagons and coaches, where reduction of in the weight of the vehicle reduces the cost of propulsion and in the case of goods vehicles permits greater loads to be carried and the cost of haulage to be reduced. The tare weight of railway wagons with steel underframed and aluminium alloy bodies has been reduced in India to 8.8 tons from the normal weight of an all steel wagon of 10 tons. Aeroplanes are invariably built of aluminium alloys.

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No. SC(A) -4(176)/53
Government of India
Ministry of Commerce & Industry

New Delhi, the 17th June, 1953.

From

Under Secretary to the Government of India.

To

All State Governments,

Subject:- Economy in the use of steel.

Sir,

In continuation of this Ministry's letter, No.SC(A)-3927/52 dated the 29th August,1952 above subject, I am directed to forward herewith a copy each of Appendices 'J' and 'K' (Annexure II) referred to in para. 5 under the heading " Introduction" and in para. 5 under the heading " Use of "lternative Materials " of the Report of the Committee on steel Saving for information and such action as may be necessary.

Yours faithfully,
S/d---
for Under Secretary to the Government of India

No. SC(A) -4(176) /53.

Copy, with enclosures, forwarded for information and necessary action to :-

1) The Ministries concerned at the Centre.
2) The Indian Standards Institution (through T.M. & P.Dr).
3) Iron and steel Controller,
33, Netaji Subhas Road, Calcutta.

By order,etc.,
Sd/
for Under Secretary to the Government of India.

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I.D.
18/5.

No. 1522 E
Office of the Controller of
Iron and Steel and Cement,
Military Hutments, Esplanade Maidan,
Fort, Bombay (1) 9th MAY 1953.

To

The Secretary to the Government of Bombay,
Public Works Department,
Bombay.

Subject:- Distribution of the Iron and Steel Quota for Non-agricultural purposes to small towns and villages.

In accordance with the Government orders contained in Government Resolution Labour and Housing Department No. 576/46, dated the 20th February 1950 this office has been allotting the quarterly quotas of Iron and Steel to the Collectors and Chairmen of the District Development Boards on population basis.

2. Since January the Government of India has adopted a policy of gradual relaxation of control on this commodity. One such relaxation is in respect of free sale of stocks of Iron and Steel in held by the stockists for more than 60 days from the date of intimation of their arrivals which are not covered by permits or though coveredby permits but the permit holders have not made arrangements to lift the materials within the validity period. In the light of the above orders of free sales, a Circular letter was addressed to all the Collectors and they were requested to review the stock position with the stockists under their control. From replies received some of the Collectors have informed this office that most of the demands for Non Agricultural pruposes having been met , the movement of the stocks held by the stockists is very slow and therefore the stockists are not very keen to take over the additional stocks of Iron and Steel allotted to them. The Collectors have therefore, advised this office not to make any more allotments till they actually ask for it. While some Collectors have said that the quota that is being allotted being meagre they are not in a position to meet the demands of the public for Non- Agricultural purposes pendiadequately and therefore they have a large number of applications pending with them. They have therefore, requested this office to make additional allotments to meet the pending demands of their districts. These

P.T.O.

are mostly for G.C.I. sheets. There is no appreciable improvement in the supply position in respect of the sheets and therefore this office is not in a position to give ~~any~~ any additional allotment.

3. However as some districts Collectors do not require their quotas for the present, it is proposed that their quotas should be given to those Districts who have many pending demands yet treating the additionnal quota as an ad-hoc quota.

4. This may please be approved early.

Controller of Iron and Steel and Cement,
B o m b a y.

X.D.
8/6.

No. CIS 1053/55501 Q.

Public Works Department.
B.C.(Bombay No 1.)
21st May 1953.

Letter.

To

The Controller of Iron and Steel and Cement, Bombay.

Subject:- Distribution of Iron and Steel quota for Non-Agricultural purposes to small towns and Villages.

Reference:- Your letter No. 1522 E, dated the 9th May 1953.

Sir, I am directed to state that in the circumstances stated, the proposal made in para 3 of your letter under reference is approved.

By order etc.

Assistant Secretary to the Government of Bombay,
Public Works Department.

s/6.D.

Letter.

Urgent.
No. CIS 1053/35379 Q. Bombay

Public Works Department,
Castle (Bombay No. 1.),
8th May 1953.

To

The Controller of Iron and Steel and Cement,
Bombay.

Subject:- Iron and Steel and Cement for Construction of Voluntary School buildings.

Reference: Your unofficial reference No. 1412 F, dated the 25th March 1953.

2. I am directed to state the following procedure should be adopted while meeting the demands of iron and steel and cement for voluntary school buildings constructed by Villagers:-

3. As regard Iron and Steel the Education Department should be requested to consolidate and forward demands for Iron and steel for voluntary school byildings as hitherto to your office for inclusiam in the quarterly demands of Government Development Schemes. All such demands should be indented by your office on behalf of the various District Local Board Autheritiea and should be met out of the current stocks at the disposal of your office, as and when required by various authorities concerned. This should be replenished by subsequent quota certificates when received from the Iron and Steel Controller Ca lcutta, in due course. Permits in respect of voluntary school buildings should be issued in favour of District Development Boards only who will be responsible for equitable distributien t villagers concerned. The District Development Boards concerned shouldbe asked to furnish certificates from the District Local Board Engineer or the Executive Engineer for proper utilisation of the allotment.

4. In the case of post demands for steel for voluntary schoo l buildings where the quota certificates and indents have already been planned by the School authorities concerned if they require iron and steel urgently you should try to meet out such demands out of your current stocks and the authorities concerned to transferred the quota certificates or indents held by them to your office as replenishment.

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5. The School authorities should be asked to apply for their minimum immediate requirements only and not in excess and for that quantity only for which they have made adequate financial arrangements to lift it.

6. As regards cement the submission of original plans together with detailed calculations etc. is not possible for villagers. You should not therefore insist on original plans and detailed calculations while considering the demands for cement for voluntary school buildings but only rough engineering appreciations should be insisted upon where the proper use of the material will be certified by the District Local Board Engineer or the Executive Engineer.

By order and in the name of the Governor of Bombay,

(P. R. Vaz.)
Assistant Secretary to the Government of Bombay,
Public Works Department.

Copy forwarded to:-

The Education Department,
All Collectors and Chairman, Development Boards,
All Executive Engineers of Divisions.

for information.

X.D.
2/6.